



DIGI
FeMa

Ministry of Infrastructure and Transport

DI.G.I.FE.MA.

3RD DIVISION - MARINE INVESTIGATIONS

Fires on board ro-ro pax ferries *Lessons learned*



Lisbon, 25 September 2015

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1. FOREWORD



1. FOREWORD

The aim of this presentation is to summarize the results of the investigations following to the very serious marine casualties occurred on board **M/V Norman Atlantic** and **M/V Sorrento**, focusing on the subsequent lessons learned

1. FOREWORD

M/n NORMAN ATLANTIC – facts and event



NORMAN ATLANTIC FACTS

Flag:	italian
Ship type:	Ro-Ro - Pax
Company:	Visemar di navigazione srl
Gross tonnage:	26904 tons
Length:	186,45 meters
Cruise speed:	23 kts
Draught:	6,7 meters

People on board
according to crew
/passenger list

419 passengers, 55 crew
members

- December 27th 2014, 16.50 : the ship left Patras to Igoumenitsa
- December 27th 2014, 23.13: stop over at Igoumenitsa
- December 28th 2014, 00.50: the ship left Igoumenitsa to Ancona
- At 04.18A a smoke detector alarm sounded on the bridge, indicating Fire on Deck 4 Garage Area at Frame 156.
- At 04.23A the fire on Deck 4 was acknowledged (weather conditions S/SW 45 knots – Temperature 2° C)

1. FOREWORD

ASSETS

UNTIL 291449A DECEMBER 2014 – TIME OF THE END OF SHIP'S EVACUATION



JRCC Piraeus

SAR MISSION COORDINATOR
from 04.50A to 09.00A December 28

- nr. 1 aircraft
- nr. 3 helicopters



MRCC Rome – Coast Guard
SAR MISSION COORDINATOR
from 09.00A until the end of the
operations

- nr. 2 aircrafts designed as ACO
- nr. 2 helicopters – involved in 13 missions
- nr. 4 patrol vessels



- nr. 1 aircraft designed as ACO
- nr. 6 helicopters
- nr. 1 ship designed as OSC
- nr. 4 helicopters



- nr. 1 patrol vessel



RCC Tirana

- nr. 13 merchant vessels
- nr. 5 tug boats



1. FOREWORD

SAR OPERATIONS RESULTS



PASSENGER RESCUED BY HELICOPTERS:

FLIGHT OPERATIONS LASTED UNTIL 14:49 December 29 WITHOUT STOPPING,

358



PASSENGER EVACUATED BY NORMAN ATLANTIC SAFETY EQUIPMENT

88



PASSENGERS RESCUED BY PATROL BOATS:

6

1. FOREWORD

Investigations

At this time, according to the current Italian legislation, three different types of investigation are in progress for the Norman Atlantic event:

- Administrative;
- Technical; and
- Criminal.

Unfortunately, the criminal investigation takes the precedence on the other two.

1. FOREWORD

Ship's status

M/n Norman Atlantic is at the moment in Bari under seizure by the Judicial Authority; The garage ramp has been opened but it is still difficult to enter deck 3 and 4 because are full of burned materials.



1. FOREWORD

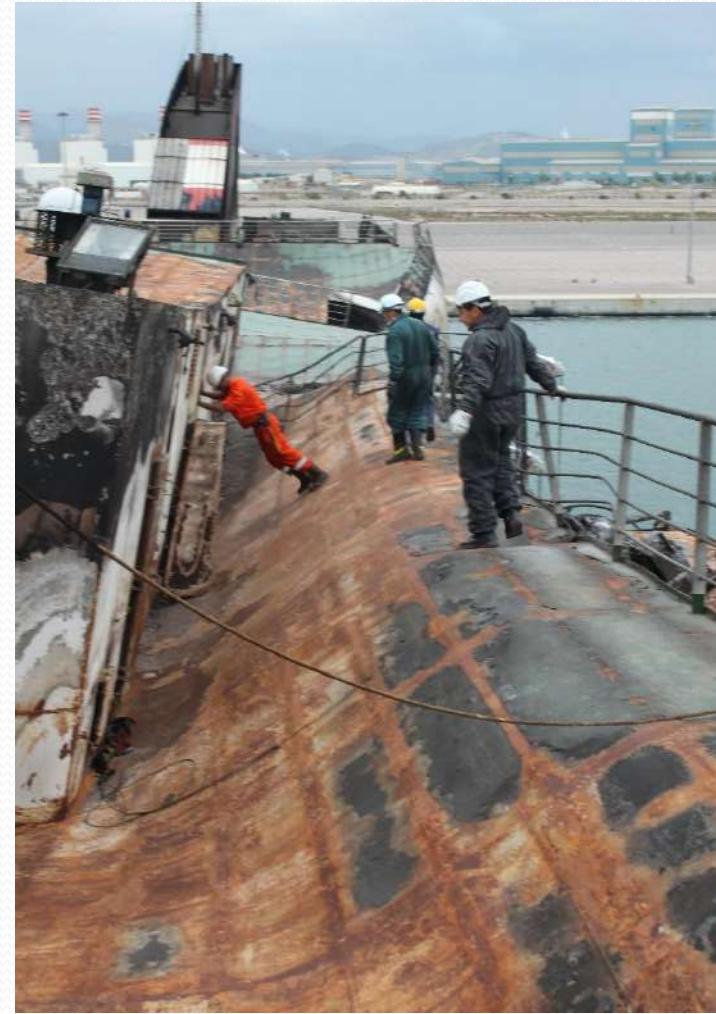
A similar event: M/v Sorrento

DIGIFEMA is also involved, as lead investigation State, in the ro-pax pax Sorrento case that is very similar:

- On the 28/04/2015, **M/V Sorrento** was in navigation from Palma de Mallorca to Valencia.
- At 12.45 UTC the ship transmitted the distress signal, indicating Fire on Board.
- Fire developed at **deck 4 – Frame 168**.



1. FOREWORD



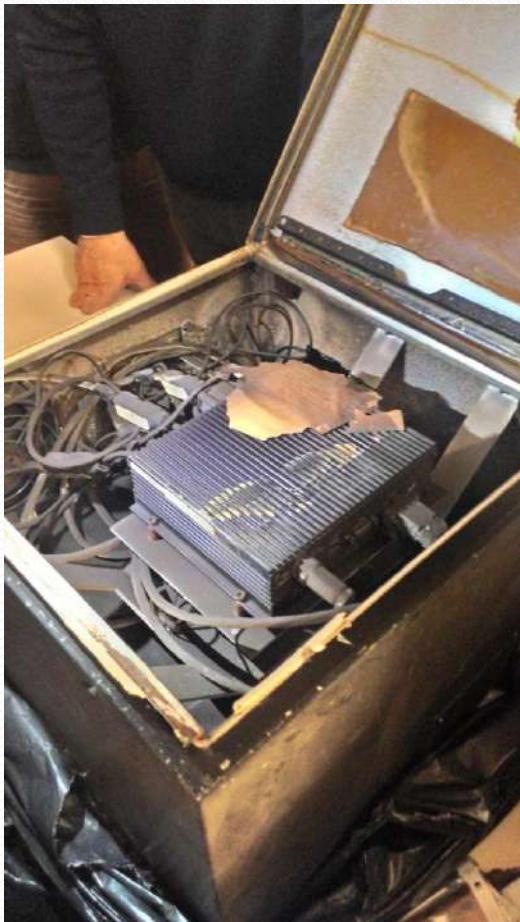
M/V Sorrento

2. INVESTIGATION



2. INVESTIGATION

NA - Information retrieved from the VDR



- ✓ On 22 Jan 2015 an hearing has been carried out and an attempt for retrieving data from the NA's FRM (VDR capsule) was performed successfully. Nonetheless, the audio part of the recording didn't work. **During the last hearing, carried out on 25 sep, the audio was recovered**
- ✓ The device is actually seized by the Judicial Authority that is evaluating the possibility to send the HD (damaged by the fire) to the manufacturer for attempting data retrieval
- ✓ Also **AUTRONICA** was analysed but no significant information were retrieved

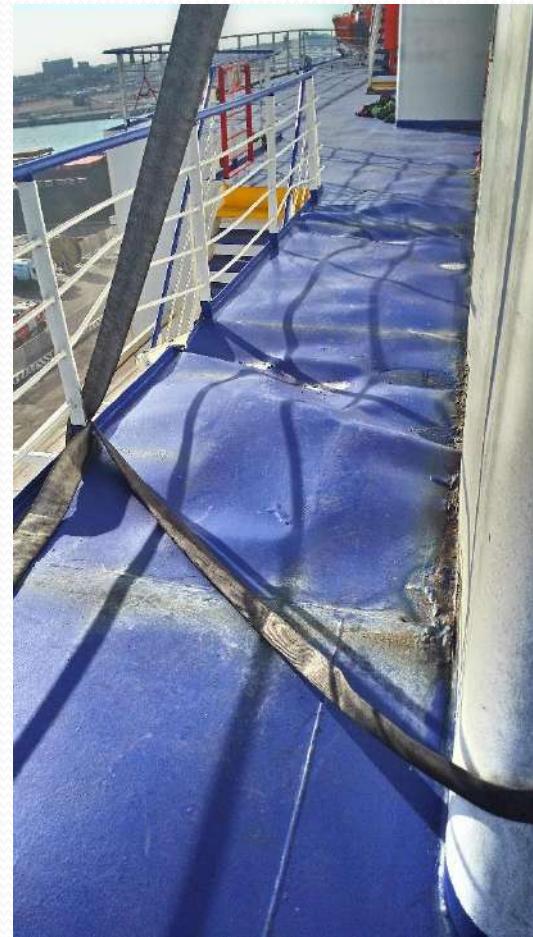


2. INVESTIGATION

M/V Norman Atlantic - Description of the damage

- M/v Norman Atlantic was severely damaged by the high temperature originated by the fire from Deck 3 up to the upper decks
- The average temperature reached on Deck 4, in the open ro-ro cargo space, was estimated to be higher than 1000 C°
- The only safe area available to passengers and crew was on the fore part of Deck 8

2. INVESTIGATION



2. INVESTIGATION

Possible fire causes analysis

- unauthorized operation of portable gas fuelled heating equipment
- use of flammable liquids
- use of open flames
- electrical system fault
- failure functioning of electric users

2. INVESTIGATION

Possible fire causes analysis

The functioning of portable gas fuelled heating equipment (not allowed on board), usage of flammable liquids or open flames could be addressed to the presence of unauthorized passengers / stowaways in the garage 4

2. INVESTIGATION

Possible fire causes analysis

The most possible cause can be referred to an **abnormal demand of electric users associated to a trailer.**



2. INVESTIGATION

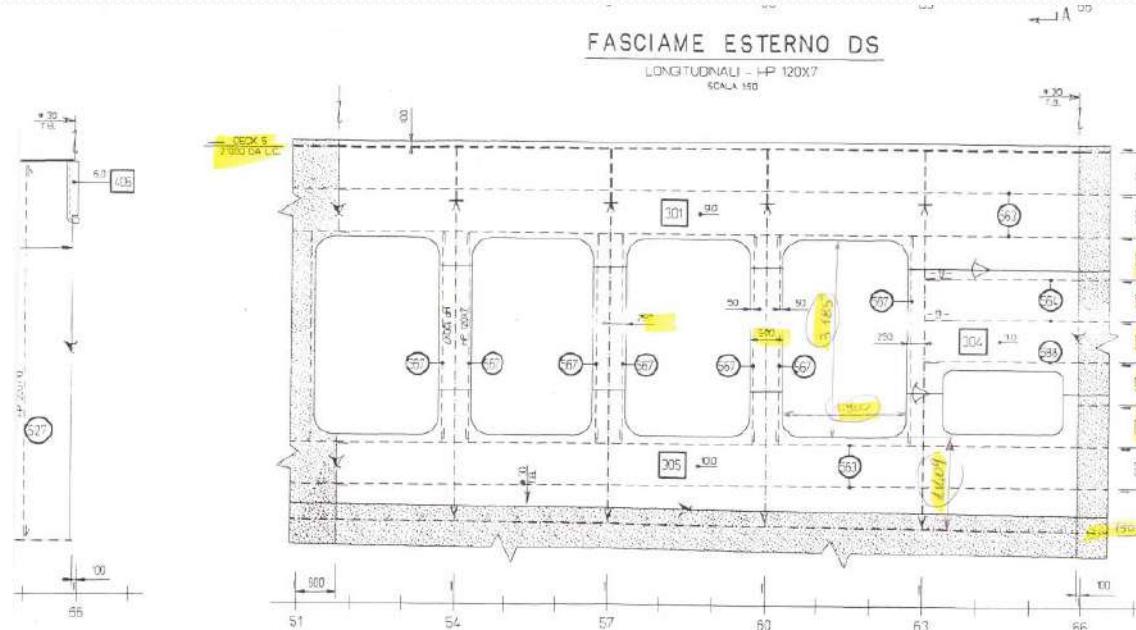
Fire propagation

The preliminary analysis of the behavior and the performance of the fume plume to cross-wind, the environment in which it developed the fire (deck 4) is considered particularly important since it is similar to a garage with **large side windows and one side, the stern one, completely open** and with no means of closing.



2. INVESTIGATION

Fire propagation



Number of openings per side: 20

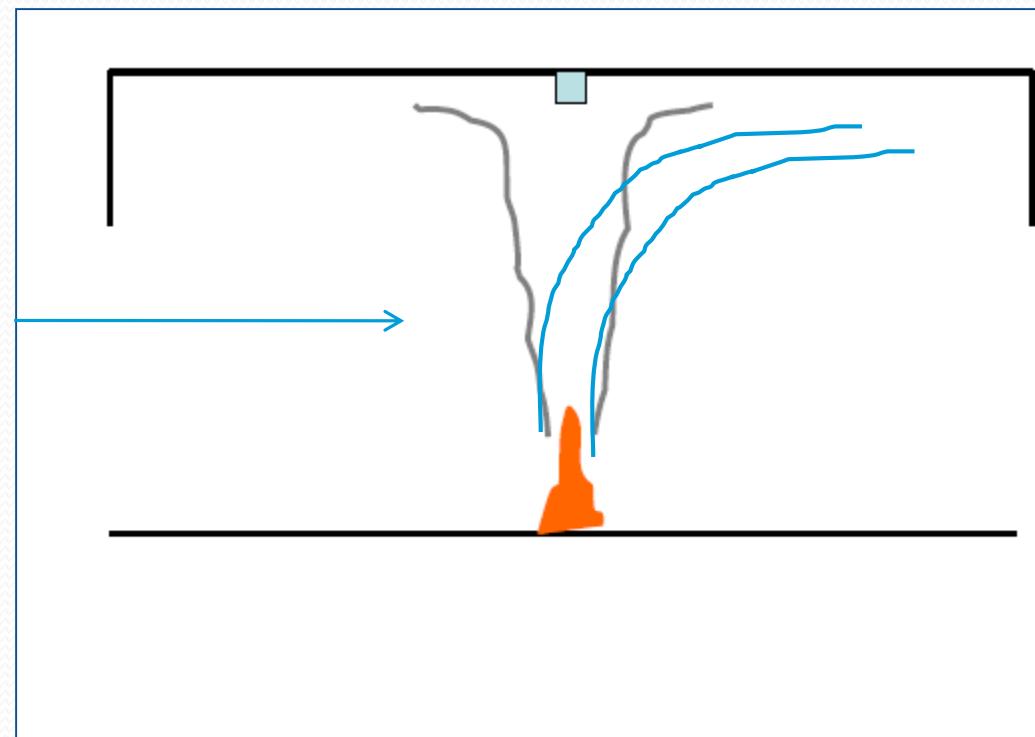
Dimensions: l 1,9m x h = 3,185 m

Total openings surface per side: 121 mq

2. INVESTIGATION

Fire propagation

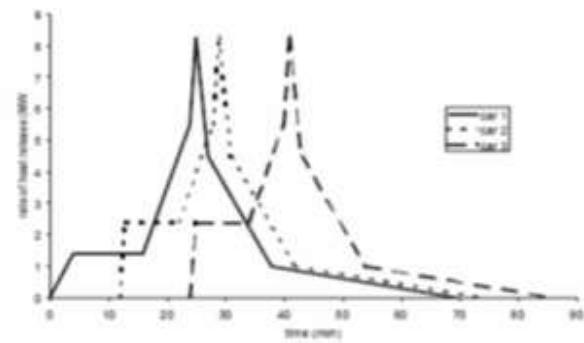
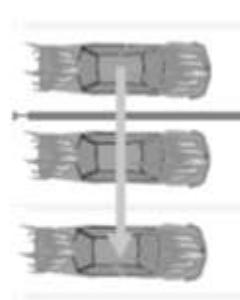
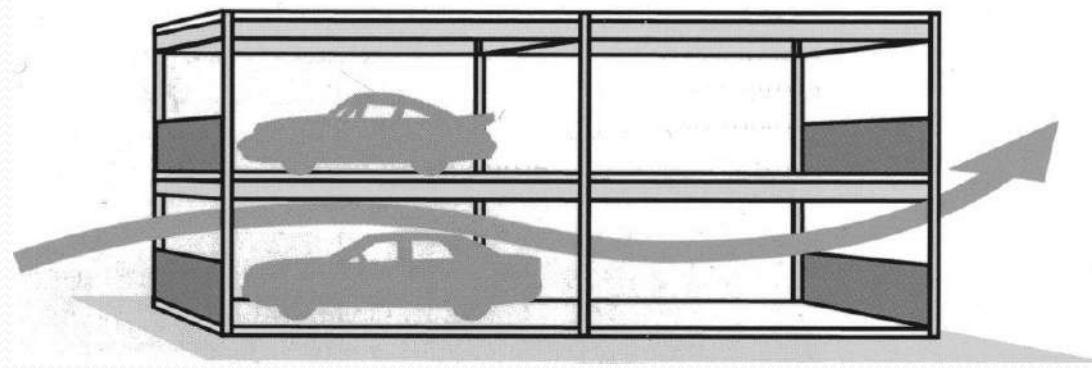
The relative high speed of the wind and its direction has certainly influenced the course of the plume and the layering of the smoke. **These factors might have influenced the response of the smoke detectors.**



2. INVESTIGATION

Fire propagation

In windy conditions, the smoke-detectors placed right over the fire could therefore not be activated and fire could have spread quicker.



- ▶ Burning amount of time between two vehicles: 12 minutes

2. INVESTIGATION

Fire propagation

A simulation has been carried out taking into consideration the presence of a fire at Deck 4 Frame 156 originating by CHP system of a reefer, placed in the back side of the truck and the following values/weather conditions:

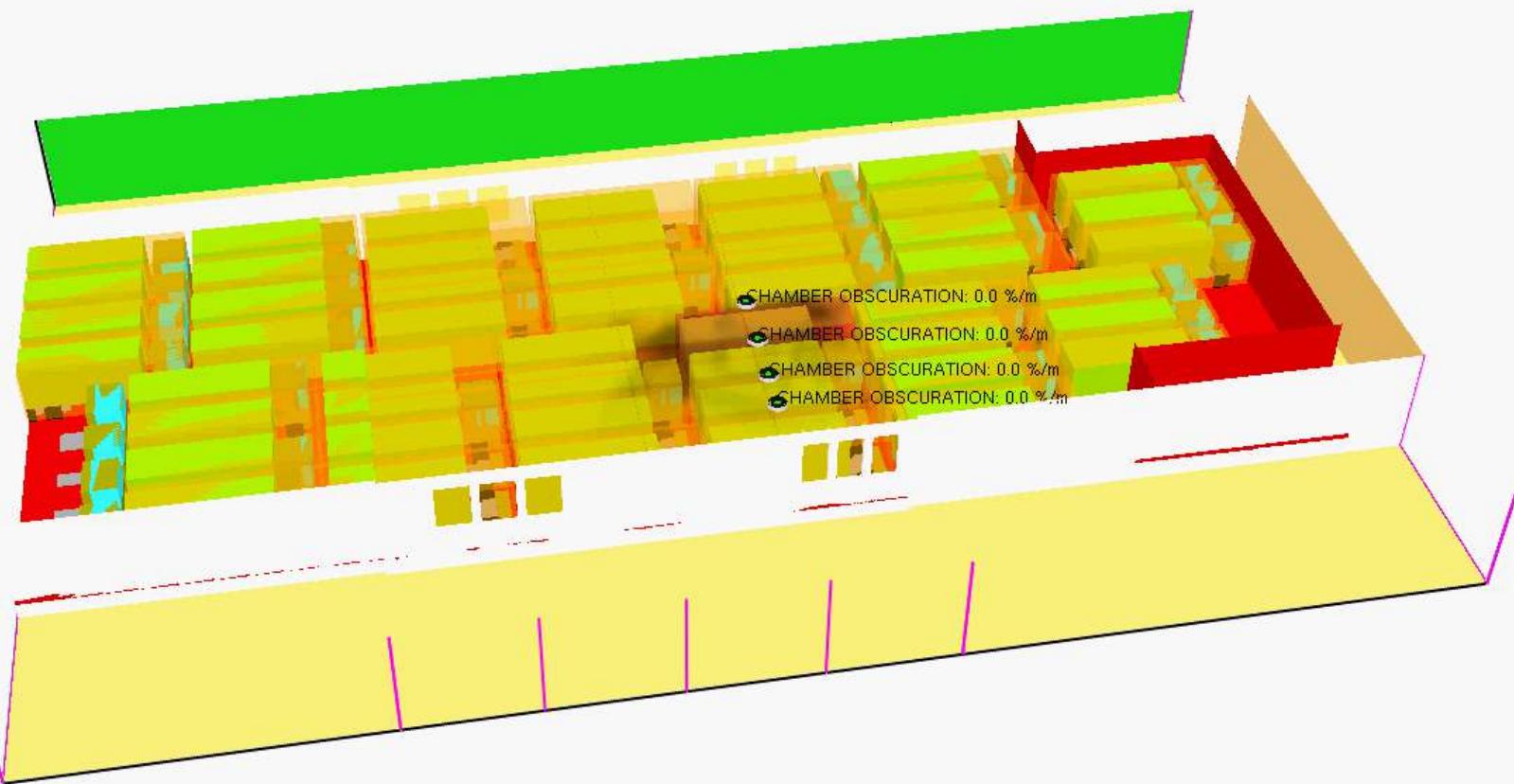
- ✓ Course 304
- ✓ Wind direction SSO 201
- ✓ Wind speed 43 Kts
- ✓ Relative wind 255 – speed 30 Kts



nave27032015



Smokeview 6.1.12 - Oct. 1 2014



Frame: 15

Time: 6.0

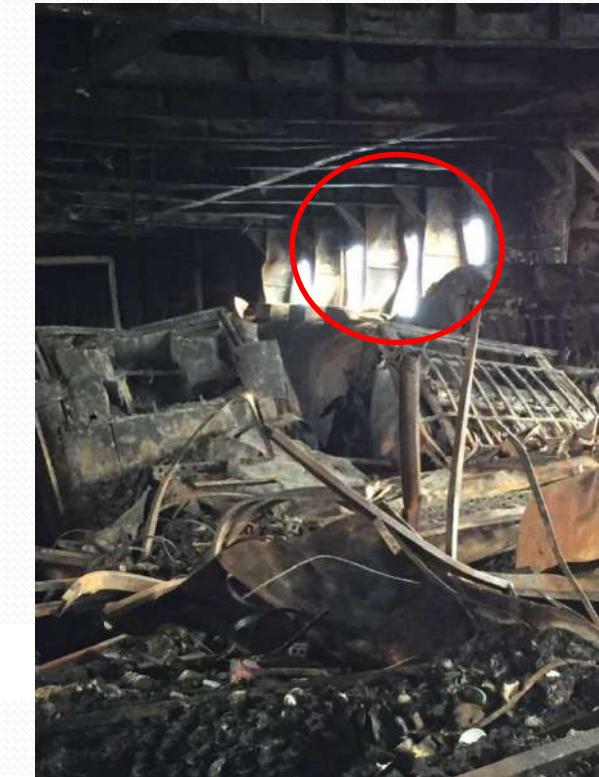
 >80 (kW/m³)

mesh: 1

2. INVESTIGATION

Fire propagation

The detrimental effects of the wind are highlighted by the deformations that can be found on the ship.



Evidence of the structure, almost intact, despite the heat due to the high fire load

Evidence of major deformations of the structure due to the heat caused to the high fire load and effect of the wind direction

2. INVESTIGATION

Loss of power

After few minutes the ship lost propulsion and around ten minutes later she was affected by a general blackout causing the complete loss of control of the vessel.

Loss of power is estimated to have occurred between 04.41 – 04.54A, few minutes after the Fire Alarm on deck 4

A specific technical inquiry has been appointed to an expert in order to answer mainly to the following questions:

- Why the auxiliary DGs stopped
- Why the DGE didn't work properly

The report is due within the **15 of October**.

2. INVESTIGATION

Emergency diesel generator malfunctioning

- It was also stated that the EDG was controlled and operated manually by the Chief Engineer and Electrician. However, during last inspection on board **the EDG fuel tank was found almost full** and the relevant fuel valves were closed.



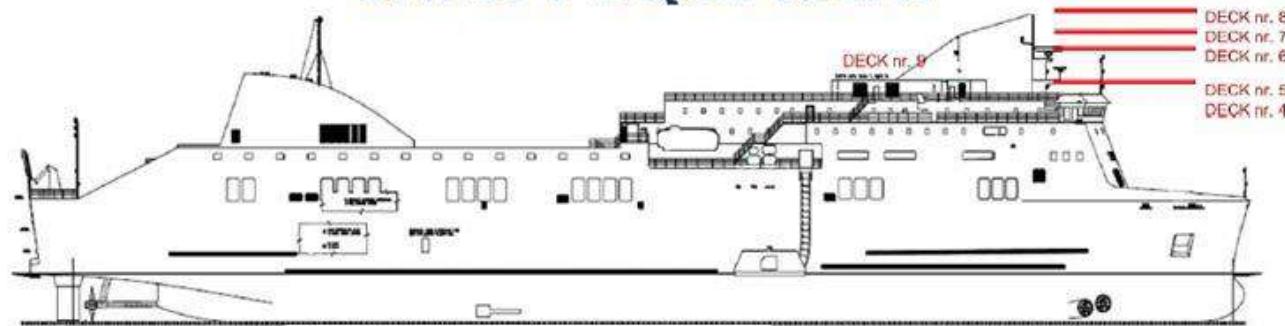
2. INVESTIGATION

Quick closing valves status

- Remote controls for QCV located on deck 5 were found unused but in the ER only the DGs fuelling valve was found open.

2. INVESTIGATION

SAFETY EQUIPMENT



n.2 Lifeboats (150 passengers capacity)



n. 2 fast rescue boat



n. 10 liferaft

(2 M.O.R. - Mean of Rescue for 25 people e nr. 8 for 101 people)



n. 24 lifebuoys



Lifejackets

2. INVESTIGATION

Life Saving Appliances issues

RIGHT SIDE- HIGHER FLAMES AND SMOKE

- All evacuation means and safety equipment on this side were unusable.

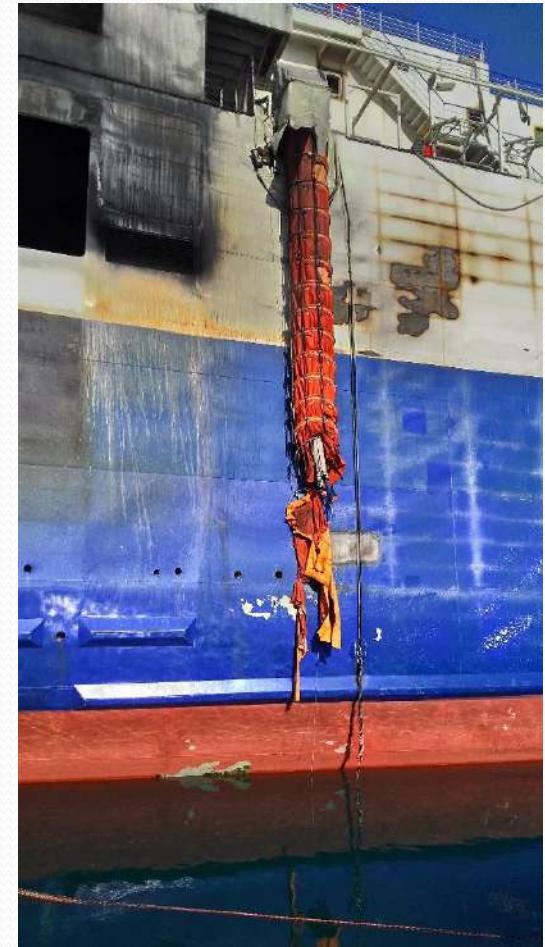
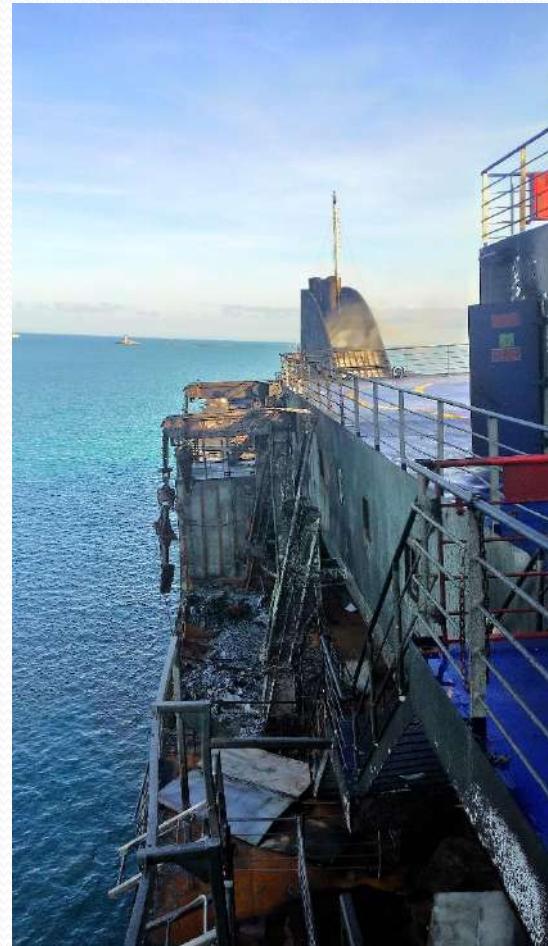
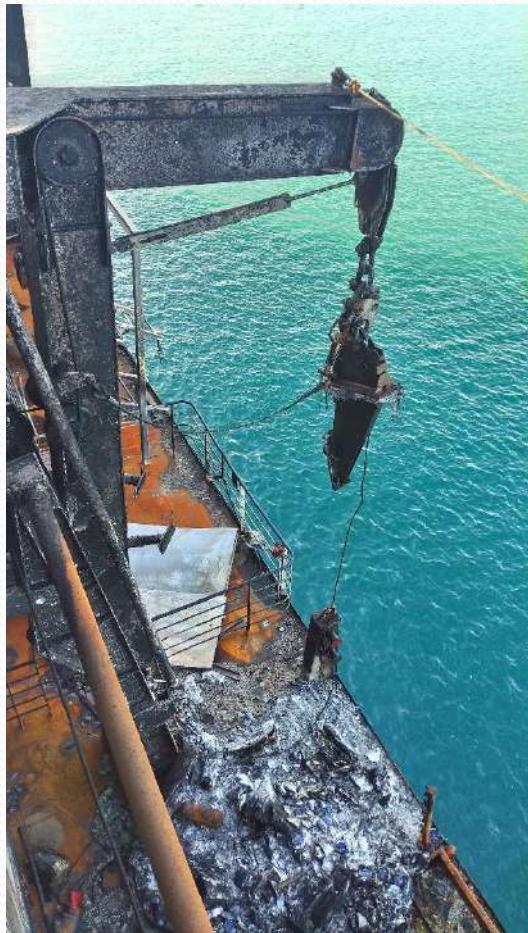
LEFT SIDE

- Captain of Norman Atlantic reported that the rafts were launched into the sea directly by passengers without a specific order;
- The chute was unusable because obstructed by two people who had remained trapped inside and damaged due to adverse weather conditions and flames.
- The many attempts to tow had a negative result. The tugs could only place the bow of the unit toward the direction of the wind in an attempt to limit roll movements and control the direction of the smoke;
- SAR naval units suffered damages in an attempt to get closer to the hot hull.



2. INVESTIGATION

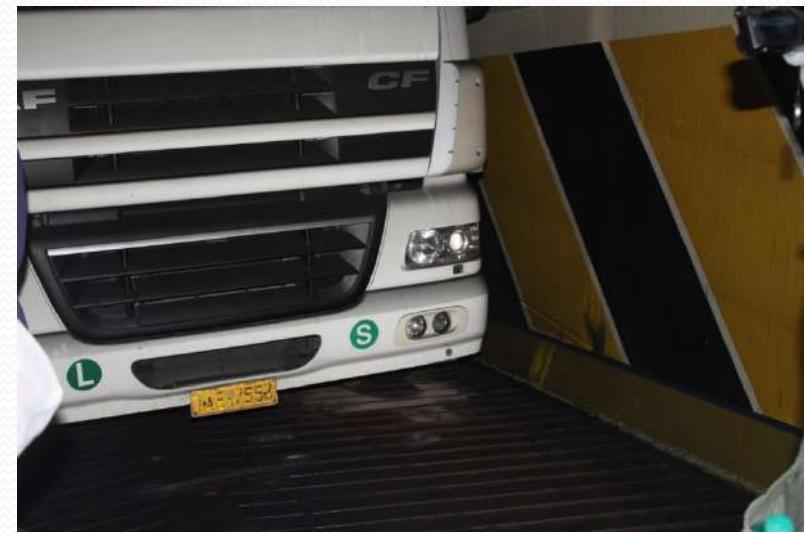
LSA status



2. INVESTIGATION

Lashing

- During last access on board in July it was possible to visit Deck 1 and 2 and some trucks were found not properly lashed.



2. INVESTIGATION

General Emergency management and Bridge Team

- The Captain, took the command since the beginning of the emergency . So far, since VDR audio shall still be analyzed, it was possible to build a chronology of the main events only by the interviews / alarms recorded on VDR / SAR communications:
 - ✓ 04.18 First alarm – AB on duty sent to Deck 4 reports smoke from a truck
 - ✓ 04.23 Fire Alarm
 - ✓ 04.26 Crew call
 - ✓ 04.28 Chief Mate sent to deck 4
 - ✓ 04.32 Captain informed about fire on deck 4
 - ✓ 04.33 Captain orders Drench pump start from ECR
 - ✓ 04.34 General Emergency alarm sounded
 - ✓ 04.36 ECR abandon by ER personnel on duty

2. INVESTIGATION

HF - ECR crew issues

- As per Muster List the valves of the drencher system were to be manoeuvred by the 1st Engineer. In fact, he assumed correctly his role during the Emergency and communicated more times with the Bridge to confirm the exact position of the fire, but.....

2. INVESTIGATION

HF - ECR crew issues

..... the valves found open on board were those...



corresponding to Deck 3....

2. INVESTIGATION

MSM and organization on board

- The ship was manned with 56 crewmembers and by a general overview it results to have been correctly manned in terms of number and qualifications of the crew members
- The particular type of contract (deck & engine) could have caused some issues in the general management of the ship operations

2. INVESTIGATION

MSM and organization on board

- More specifically the shipowner provided all the crew related to the deck & engine while the charterer provided all the crewmembers dedicated to the «commercial management» of the ship including crew appointed to the lashing operations in the garage.

2. INVESTIGATION

MSM and organization on board

- Moreover it should be noted that the charterer's crew was embarked on the 15th of December and that they had just completed only three voyages before the casualty.
- The assistant Electrician (appointed to cable connections on Deck 4) embarked the day of the casualty.
- Furthermore, the ship stopped for three days before departing from Patras because of Christmas holidays.

2. INVESTIGATION

M/V NORMAN ATLANTIC

- ✓ 18 fatalities / some injured persons
- ✓ Just 88 passengers / crewmembers abandoned the ship safely using the port lifeboats
- ✓ Severe damages from deck 3 to 7
- ✓ M/V NORMAN ATLANTIC was operating as chartered ship
- ✓ the F team declared to have faced difficulties for reaching the source of the fire because narrow passages among the vehicles
- ✓ HF influenced the emergency because wrong valves were opened

M/V SORRENTO

- ✓ No fatalities / injured persons
- ✓ All passengers / crewmembers abandoned the ship safely and quickly using the two lifeboats (just 196 pax on board...)
- ✓ M/V Sorrento suffered more severe damages than Norman
- ✓ M/V Sorrento was also a chartered ship
- ✓ the F team faced difficulties for reaching the source of the fire for the same reasons as well
- ✓ Casualty – so far – doesn't appear to be related also to HF (wrong Drencher valves opening) and Drencher was activated promptly

2. INVESTIGATION

But Fire started in the same area ... **Deck 4 (open garage) frame 168** and even if in presence of a prompt activation of the Drencher system and quick intervention of the F team, M/V Sorrento **was lost as well.**



3. PRELIMINARY OBSERVATIONS



3. PRELIMINARY OBSERVATIONS

Following observations are related to

Norman Atlantic case.

3. PRELIMINARY OBSERVATIONS

LSA (mini chute)

LSA-Code:

.....*A marine evacuation system shall be:*

*.7 capable of providing a satisfactory **means of evacuation in a sea state associated with a wind of force 6 on the Beaufort scale** ;*

3. PRELIMINARY OBSERVATIONS

LSA

- The mini-chute on the port side was unusable because of the missing liferaft. By the evidences collected so far, it appears that the first two people entering the chute, when arrived in the liferaft connected to the device and cut the rope in order to escape.
- The starboard lifeboat was - at a certain point in time - unserviceable due to the damages caused by the high flames spreading through the side openings and the high temperatures in the garage, despite of the A.60 class fire insulation fitted at the garage's outer boundaries.

3. PRELIMINARY OBSERVATIONS

Loss of power

By the evidences collected so far, the black out could be probably addressed firstly to the presence of smoke in the ER that lowered the amount of air available and consequently caused Engines and DGs stop.

The EDG couldn't align with the electrical systems probably because of short circuits (as by interviews).

We are expecting the result of the specific inquiry.

3. PRELIMINARY OBSERVATIONS

Crew issues

- Lack of familiarization
- Scarce integration between Italian and Greek crewmembers
- Language problem, since basically only a limited number of crewmembers appeared to own a satisfactory level of English

3. PRELIMINARY OBSERVATIONS

Company Issues

- ISM manual doesn't include specific items for this type of charter, moreover the charter agreement establishes particular duties / responsibilities both for the shipowner and for the charterer that are not described within the ISM procedures.

4. LESSONS LEARNED



4. LESSONS LEARNED

The analysis of the casualty data available related to M/V NORMAN ATLANTIC case - so far - conducts to the following possible SRs:

- open ro-ro cargo spaces on passenger ships (new construction) should not be permitted;
- Enhancement of passive protection of LSA from fire (garage openings);
- VDR (DMM) resistance to fire should be improved on existing ships;
- stricter procedures in order to verify the possible presence of persons in the garage during navigation (i.e. more frequent and detailed patrols) should be established;
- different crews belonging to different companies on chartered ships should be avoided;

4. LESSONS LEARNED

- stricter procedures in order to verify the possible presence of persons in the garage during navigation (i.e. more frequent and detailed patrols) should be established;
- CCTV system for access / internal ro-ro cargo spaces immediate control with recording capabilities should be installed;
- Fitting of thermal detection system should be implemented;
- Enhancement of the efficiency of the fixed fire fighting extinguishing systems in ro-ro spaces;
- Considerations regarding the minimum distance between vehicles should be initiated.



THANKS FOR YOUR ATTENTION!

~ D.I.G.I.FE.MA. – 3RD DIVISION ~
